In the Claims

1. A method of operating a heat exchanger including a heat transfer wall having a first surface and an opposite second surface comprising:

a) passing a cooled fluid in contact with the first surface of the heat transfer wall and passing a cooling fluid in contact with the second surface of the heat transfer wall;

b) directly monitoring the temperature of the first surface of the heat transfer wall; and

c) adjusting the flow of one of the cooled fluid and cooling fluid in response to the temperature of the first surface.

2. A method as in Claim 1 wherein adjusting the flow comprises reducing the flow of the cooling fluid in response to the temperature of the first surface falling to a level at least 50 degrees below the freezing temperature of the cooled fluid.

3. A method as in Claim 1 wherein the cooled fluid is an organic and adjusting the flow occurs when the temperature of the first surface falls to a level at least 50 degrees below the freezing temperature of the organic.

4. A method as in Claim 1 wherein the cooling fluid is a cryogen and adjusting the flow comprises decreasing the flow of the cryogen when the temperature of the heat transfer surface falls to at least 50 degrees below the freezing temperature of the cooled fluid.

5. A method as in Claim 1 wherein the cooled fluid is an organic having a freezing temperature of at least –143.5°F, the cooling fluid is a cryogen and adjusting the flow comprises reducing the flow of the cryogen when the temperature of the first surface falls at least 50 degrees below the freezing temperature of the organic.

6. A method as in claim 1 wherein the cooling fluid is a cryogen and adjusting the flow comprises reducing the flow of the cryogen when the

temperature of the first surface falls to within 50 to 75 degrees of the temperature of the cryogen.

7. A method as in Claim 1 wherein adjusting the flow of one of the cooled fluid and cooling fluid is accomplished in response to the temperature of the first surface decreasing at a rate exceeding a predetermined value.

8. A method as in Claim 1 wherein monitoring is accomplished by a thermocouple fixed directly to the first surface.

9. A method of operating a heat exchanger encompassing a tube wall having inner and outer surfaces, comprising:

a) flowing a cooling fluid through the tube and in heat exchange contact with the inner surface of the tube wall at a first flow rate;

b) passing a cooled fluid in heat exchange contact with the outer surface of the tube wall;

c) measuring the temperature of the outer surface of the tube wall; and

d) decreasing the flow of the cooling fluid to a second flow rate in response to the temperature of the outer surface falling at least 50 degrees below the freezing temperature of the cooled fluid to prevent the freezing of the cooled fluid onto the outer surface.

10. A method as in claim 9 comprising restoring the first flow rate upon the temperature of the outer surface increasing to within 50 degrees of the freezing temperature of the cooled fluid.

11. A method as in claim 9 wherein the cooling fluid is a cryogen and decreasing the flow of the cryogen occurs when the temperature of the outer surface falls to within 50 to 75 degrees of the temperature of the cryogen.

12. A heat exchange apparatus comprising:

a) a housing containing flow paths for a cooled fluid and a cooling fluid, the housing having a heat transfer wall with a first surface for contacting the cooled fluid and a second surface for contacting the cooling fluid;

b) monitoring means for directly monitoring the temperature of the first surface of the heat transfer wall; and

c) adjusting means acting responsive to the temperature of the first surface for adjusting the flow of one of the cooled fluid and cooling fluid through the heat exchanger so as to prevent the freezing of the cooled fluid onto the first surface.

13. Apparatus as in Claim 12 wherein the monitoring means comprises at least one thermocouple attached directly to the first surface.

14 Apparatus as in Claim 12 wherein the adjusting means acts responsive to a temperature of the first surface that is at least 50 degrees below the freezing temperature of the cooled fluid.

15. Apparatus as in claim 12 wherein the cooling fluid is a cryogen and the adjusting means acts in response to a temperature of the first surface that is within 50 to 75 degrees of the temperature of the cryogen.